

tor to output a haptic effect approximating another sensation, for example, heat. In such an embodiment, the processor may output a haptic signal configured to cause the actuator to output a high frequency jolting effect, when the user touches elements of the display that are associated with heat.

Advantages of Systems and Methods for a Texture Engine

[0086] There are many advantages of systems and methods for a texture engine. For example, systems and methods of a texture engine adds a previously unused haptic effect to a mobile device. This new effect provides a new avenue for the user to receive information from the mobile device, without the user having to look at the display of the mobile device. For example, systems and methods of a texture engine may allow the user to assign different textures to different icons, buttons, or other components of their display. Thus, the user may be able to determine which icon they are touching, without having to look at that icon. This may increase usability of the device, and may make a device more useful to the visually impaired.

[0087] Further, because systems and methods for a texture engine provides the user with more information, without distracting the user from other tasks, it will reduce user error. For example, users will be less likely to hit the wrong icon or press the wrong key if they are utilizing systems and methods for a texture engine. This functionality may serve both to increase user satisfaction and increase the adoption rate for technology that incorporates systems and methods for a texture engine.

General Considerations

[0088] The use of “adapted to” or “configured to” herein is meant as open and inclusive language that does not foreclose devices adapted to or configured to perform additional tasks or steps. Additionally, the use of “based on” is meant to be open and inclusive, in that a process, step, calculation, or other action “based on” one or more recited conditions or values may, in practice, be based on additional conditions or values beyond those recited. Headings, lists, and numbering included herein are for ease of explanation only and are not meant to be limiting.

[0089] Embodiments in accordance with aspects of the present subject matter can be implemented in digital electronic circuitry, in computer hardware, firmware, software, or in combinations of the preceding. In one embodiment, a computer may comprise a processor or processors. The processor comprises or has access to a computer-readable medium, such as a random access memory (RAM) coupled to the processor. The processor executes computer-executable program instructions stored in memory, such as executing one or more computer programs including a sensor sampling routine, a haptic effect selection routine, and suitable programming to produce signals to generate the selected haptic effects as noted above.

[0090] Such processors may comprise a microprocessor, a digital signal processor (DSP), an application-specific integrated circuit (ASIC), field programmable gate arrays (FPGAs), and state machines. Such processors may further comprise programmable electronic devices such as PLCs, programmable interrupt controllers (PICs), programmable logic devices (PLDs), programmable read-only memories (PROMs), electronically programmable read-only memories (EPROMs or EEPROMs), or other similar devices.

[0091] Such processors may comprise, or may be in communication with, media, for example tangible computer-readable media, that may store instructions that, when executed by the processor, can cause the processor to perform the steps described herein as carried out, or assisted, by a processor. Embodiments of computer-readable media may comprise, but are not limited to, all electronic, optical, magnetic, or other storage devices capable of providing a processor, such as the processor in a web server, with computer-readable instructions. Other examples of media comprise, but are not limited to, a floppy disk, CD-ROM, magnetic disk, memory chip, ROM, RAM, ASIC, configured processor, all optical media, all magnetic tape or other magnetic media, or any other medium from which a computer processor can read. Also, various other devices may include computer-readable media, such as a router, private or public network, or other transmission device. The processor, and the processing, described may be in one or more structures, and may be dispersed through one or more structures. The processor may comprise code for carrying out one or more of the methods (or parts of methods) described herein.

[0092] While the present subject matter has been described in detail with respect to specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing may readily produce alterations to, variations of, and equivalents to such embodiments. Accordingly, it should be understood that the present disclosure has been presented for purposes of example rather than limitation, and does not preclude inclusion of such modifications, variations and/or additions to the present subject matter as would be readily apparent to one of ordinary skill in the art.

That which is claimed is:

1. A system comprising:

a processor configured to:

receive a display signal comprising a plurality of pixels;
determine a haptic effect comprising a texture; and
transmit a haptic signal associated with the haptic effect;
an actuator in communication with the processor, the actuator configured to receive the haptic signal and output the haptic effect.

2. The system of claim 1, wherein the texture is a vibrotactile effect.

3. The system of claim 1, wherein the texture comprises the texture of: sand, lizard skin, or a brick.

4. The system of claim 1, wherein the actuator comprises one of: an eccentric rotating mass motor, a linear resonant actuator, shape memory alloy, electroactive polymer or a piezoelectric actuator.

5. The system of claim 1, wherein the haptic effect is determined based at least in part on the display signal.

6. The system of claim 5, wherein each of the plurality of pixels is associated with a color, and wherein determining the haptic effect comprises assigning a haptic value to the color.

7. The system of claim 6, wherein determining the haptic effect comprises assigning a haptic value to only some of the plurality of pixels.

8. The system of claim 6, wherein each color comprises an intensity, and determining the haptic effect further comprises adjusting the haptic value to correspond to the intensity.

9. The system of claim 1, further comprising a display in communication with the processor, the display configured to receive the display signal and output an image.

10. The system of claim 9, wherein the texture is output onto a surface of the display.